

requisite motivation must stem from some teaching, suggestion or inference in the prior art as a whole or from the knowledge generally available to one of ordinary skill in the art and not from Applicants' own disclosure. See, for example, *Uniroyal, Inc. v. Rudkin-Wiley Corp.*, 837 F.2d 1044, 1052, 5 USPQ2d 1434, 1439 (Fed. Cir. 1988). If the Examiner fails to establish a *prima facie* case, the rejection is improper and will be overturned. See *In re Fine*, 837 F.2d 1071, 1074, 5 USPQ2d 1596, 1600 (Fed. Cir. 1988).

Even if the Examiner has shown in the prior art relied upon that certain individual features of the claimed subject matter may be known, such a showing alone cannot support a rejection under 35 U.S.C. § 103. Knowledge of separate features is not the appropriate test for obviousness under § 103. Rather, the proper test for obviousness is whether the claimed subject matter taken as a whole, in light of all of the teachings of the references in their entireties, would have been obvious to one of ordinary skill in the art at the time the invention was made. See *Connell v. Sears Roebuck Co.*, 722 F.2d 1542, 1549, 220 USPQ 193, 199 (Fed. Cir. 1983). Applicants fail to appreciate how a swimming pool filtration system or a pretreatment system for acid treatment and reverse osmosis is related to the claimed home water softening systems. Moreover, even if we assume the mere fact that the applied references *could* be combined or expanded in a manner which might result in the claimed subject matter, this does not make the proposed modification obvious unless the references fairly suggest the desirability of the modification or expansion. See *In re Gordon*, 733 F.2d 902, 221 USPQ 1125, 1127 (Fed. Cir. 1984).

In the present case, the dissimilar objectives of the applied references, coupled with the lack of an incentive in the references themselves for making the modifications proposed by the Examiner, leads to the conclusion that the rejection is not well founded. When we consider the

teachings of the applied references together, forgetting about what Applicants have taught in the present application, it becomes clear that without Applicants' teachings, the references themselves would not have fairly motivated the person of ordinary skill in the art to make the claimed invention.

The lack of support for this rejection is even more evident by a close analysis of the claimed invention. As is clear from the specification and claims, the invention is directed to a small-scale water softener, such as an individual residential unit. The apparatus uses a nanofiltration filter element to selectively remove hardness ions, in particular large ions (such as the divalent ions of calcium and magnesium). The present invention provides numerous advantages over prior art small-scale water softening systems, including the significant benefit that it softens water without adding salt to the wastewater stream. The softening apparatus is also generally highly efficient, and able to produce an output flow of permeate water containing greater than 80 percent of the input flow. In certain embodiments the output flow of permeate water contains greater than 85 percent of the input flow, while in yet other embodiments the output flow of permeate water contains greater than 90 percent of the input flow.

The present invention is suitable for production of softened water from relatively low pressure at sufficiently high flow rates to satisfy typical residential water needs. Water softeners made in accordance with the invention can produce suitable sustainable flow at a pressure of less than 200 pounds per square inch. Specific embodiments of the invention provide an apparatus configured and arranged to have an output flow of permeate water of 200 gallons or more per 24-hour period. The output flow of permeate water generally can have, for example, a hardness below 3.5 grains per gallon. The system includes at least one nanofiltration filter element configured and arranged to receive an input flow of hard water, discharge an output flow of

permeate water comprising a portion of the input flow, and discharge an output flow of non-permeate water comprising a portion of the input flow; wherein the output flow of permeate water has a lower hardness than the output flow of non-permeate water. Thus, Applicants teach and claim a system that allows high rejection rates and sufficient flow rates to make it suitable for use in a compact residential water softening system.

In the present Office Action the Examiner has expanded the cited references to cover the claimed invention without providing adequate support as to why such expansion is appropriate. It is improper to make this factual-based determination upon subjective belief and unknown authority. *W.L. Gore v. Garlock, Inc.*, 721 F.2d 1540, 1553, 220 USPQ 303, 312-13 (Fed. Cir. 1983). Applicants respectfully assert that the Examiner has failed to make a *prima facie* case of obviousness. In this regard, Applicants first note that neither Collentro nor Cluff is directed to water softening systems for potable water supplies, and in particular neither is directed to the type of small-scale water softening systems described in the specification and claims of the instant application. Collentro is directed to a process for the production of high purity water using reverse osmosis, and is not directed to a small-scale water softening apparatus. Applicants do not believe it would be obvious to use a complex reverse osmosis system as a residential water softener. Cluff is directed to a semi-permeable membrane filtering system for swimming pools. Applicants do not believe it would be obvious to use a swimming pool filter to soften potable water in a house. Thus, Applicants believe that neither of these references is relevant to the present claimed invention.

Even if the references are applied against the pending claims, Applicants believe neither reference makes obvious the claimed invention. Collentro describes using a nanofiltration membrane to pretreat water before subjecting it to acid treatment and reverse osmosis, but this

pretreatment diverges significantly from the present invention because it uses a nanofiltration membrane that is effective at removing up to only about 80 percent of large ionic radius radicals, such as calcium. Such recovery rates that are generally below 80 percent are typically inadequate for residential water softening systems as taught by Applicants, particularly in areas with high hardness, because the softening effect would be inadequate.

With regard to Cluff, the Examiner has asserted that it would have been obvious to one skilled in the art to select the appropriate pore size and the number of modules in the device in order to produce a desired flow rate. Applicants respectfully disagree with this view, and note that Cluff teaches that selective rejection of ions is a matter depending upon multiple factors. Indeed, Cluff explicitly states that rejection of molecular species below 200 molecular weight is dependent upon their size, ionic charge, and membrane affinity. Column 1, lines 37 to 40. In this regard, Cluff teaches that nanofiltration is a complicated, multi-factor process. It would not be obvious to make the system of the claimed invention.

The Examiner has further rejected claims 11, 12, 19, 26, 27, and 6 over Collentro or Cluff in view of Linder et al. (6,080,764), Waite (5,147,553), or Ramen (*Chemical Engineering Progress* article). Linder is directed to specialized membranes that are acid- and base-resistant and which also are amphoteric. Nothing in Linder teaches the claimed invention. Indeed, Linder actually teaches the non-obvious nature of the present invention by asserting that the "[nanofiltration] membrane chosen depends upon the application". Column 3, lines 41-42. This statement, along with the accompanying text at column 3, lines 27-42 which identifies the variety of membranes available, is an acknowledgement that nanofiltration membranes are not all equivalent, nor is their performance readily predictable between applications. Waite fails to teach the claimed invention even when combined with the previously discussed references, and

in particular fails to teach or make obvious an apparatus that is configured to reject at least 80 percent of calcium ions and discharge an output flow of permeate water comprising at least 80 percent of the input flow. Ramen provides broad, general information about uses for nanofiltration technology, but in no way suggests or makes obvious the claimed invention.

Finally, the Examiner has rejected claims 10 and 33 under 35 U.S.C. § 112, second paragraph, as being indefinite. The claims have been amended to clarify that the total salt levels refers to the total salt levels for all output flows (the permeate and non-permeate water flows).

On the basis of the foregoing, Applicants believe the claims are in a condition for allowance. Applicants' undersigned attorney invites the Examiner to contact him with any questions.



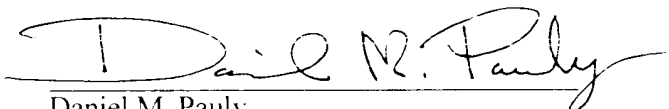
Respectfully submitted,

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

10. (Once Amended) The apparatus for softening water in accordance with claim 1, wherein the apparatus does not substantially increase the total salt levels of the output flows relative to the input flow of water.

33. (Once Amended) The method for softening water in accordance with claim 31, wherein the method does not substantially increase the total salt levels of the output flows relative to the input flow of water.